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### 3 PHYSICAL AND CHEMICAL PROPERTIES OF ROSIN //

The available data on the physical and chemical properties of resin is rather limited in scope, and a number of discrepancies have been found indicating that some of the data may have been obtained on too few or on unusual samples. The following data have been assembled from sources considered reliable.

#### Gum Rosin

Gum rosin is composed largely of varying proportions of resin acids and their esters (usually 90-95 per cent) together with unsaponifiable non-acid bodies, which are usually referred to as resins. Therefore it is to be expected that there will be appreciable variations in the so-called constants and the physical and chemical properties. It is believed that the ranges given for the various properties will include all authentic samples, and permit all properly determined results on normal rosin to fall within the limits. For most rosins, however, the constants fall within ranges which are relatively narrow. With the exception of color, there is not a great difference in the constants for high and low grade rosin, which so frequently overlap that variations in the ranges can be given only for the averages. For gum rosin the properties and constants should fall within the following limits.

#### Melting Point (so-called):

Capillary tube method: 60-76°C. (140-168°F.)

Thermometer bulb drop method: About 10° C. higher than by capillary tube method.

#### Acid Value:

158-172 (the lighter grades usually have slightly higher acid values).

Saponification Value: 167-184 (see note for acid value)

Unsaponifiable matter: 5.6 - 10.7% (There is no apparent relation between grade and per cent of unsaponifiable).

Ash: 0.015-0.10% (For samples free from excessive dirt. Commercially clean rosin has an average ash of 0.020%. The ash consists chiefly of silica and iron oxide).

Iodine Number (Wijs method): 205-230. B and D Rosin usually have low iodine numbers. Other grades average about 222. The pale grades tend to have higher iodine numbers than the lower grades.

Specific Gravity: 1.06-1.09.



-2-

Refractive Index: 1.546 - 1.548 at 20° C. (68°F.) The higher grades usually have the lower refractive index.

Specific Heat: 0.48 (average for temperature 86° -266° C.)

Ignition Temperature or Fire Point: Around 465°F.

Toluol Insoluble: Although this is not a constant or property, it is often determined as a measure of the foreign matter (sands, bark, dirt, etc.), and varies considerably. Well strained rosin usually does not exceed 0.05% toluol insoluble.



WOOD ROSIN

The following data are for normal untreated wood rosin of FF grade:

Melting Point:

Capillary tube method -- 55-62°C.

Thermometer bulb drop method.

Acid value: 150-158

Saponification Value: 162-168

Unsaponifiable: 8.5-14.0%

Iodine Number (Wijs method): 214-218.

Refractive Index: 0.547 at 20° C. (68°F.)

Ash: Less than 0.05%

Density (specific gravity): 1.089 at 20° C.; 0.93 at 238° C.

Mean Specific Heat: 0.477 (20-135°C.)

Coef. of Cub. Expansion:  $6.37 \times 10^{-4}$  (0° - 100°C.)  
 $6.80 \times 10^{-4}$  (0° - 200°C.)

Latent Heat Vaporization: 10<sup>4</sup> btu. per pound at 253°C.

Viscosity: The viscosity of rosin is dependent on its temperature. The following formula has been proposed for calculating the viscosity of American gum and wood rosin, which has not had special treatment.

$$\log V = \frac{6.05 t_m - 54}{t - 20} - 3.50^*$$

in which  $\log V$  = common logarithm of the viscosity in poise  
 $t_m$  = melting point in °C. as determined by the drop method.

$t$  = temperature in °C. at which viscosity is desired.

The higher grades of wood rosin (WWK) have acid and saponification numbers and unsaponifiable nearer the range of gum rosin than the FF wood rosin. The following data are reported by the manufacturers of wood rosin for the higher grades:

Acid value: 161-170.

Saponification value: 167-174.

Unsaponifiable: 6.0 - 10.0%

\*(H. E. Nash, Jour. Ind. Eng. Chem., 24, 2 (1932), p. 177).





